XR-7100

SERVICE MANUAL

AEP Model
E Model

Dolby noise reduction manufactured under license from Dolby Laboratories Licensing Corporation.
"DOLBY" and the double-D symbol ◻◻ are trademarks of Dolby Laboratories Licensing Corporation.

Model Name Using Similar Mechanism	XR-780
Tape Transport Mechanism Type	MG-70A-83

SPECIFICATIONS

OTHER SPECIFICATIONS

Power amplifier section

Outputs: Speaker outputs (sure seal connectors).
Inputs: Line inputs (phono jacks)
Speaker impedance: 3.2–8 ohms
Maximum power output: 25 watts per channel at 4 ohms* (4 channels driven)
* Measured at 14.4 V

Cassette player section

Tape: Prerecorded tape cassette
Head: Playback head
Tape track: 4-track 2-channel stereo
Frequency response: 30–18,000 Hz (±3 dB)
Signal-to-noise ratio: Dolby NR off: With type II, IV cassette 58 dB (A-weighted) With type cassette 55 dB (A-weighted)
Dolby NR effect: More than 8 dB (CCIR/ARM)
Wow and flutter: 0.15% (WRMS)
Fast winding time: Approx. 100 sec. (with Sony C-60 cassette)
Crosstalk: Between channels: better than 30 dB

Tuner section

System: FM/AM superheterodyne tuner Computerized quartz-locked synthesizer system

FM tuner section

Tuning range: 87.5–108 MHz
Antenna terminal: FM/AM external antenna connector FM/AM power antenna relay control lead
Intermediate frequency: 10.7 MHz
Usable sensitivity: 11.2 dBf (75 ohms)
Sensitivity at 50 dB quieting: 16.4 dBf (75 ohms)
Selectivity: 70 dB at 400 kHz
Signal-to-noise ratio: 65 dB (stereo), 68 dB (mono)
Harmonic distortion at 1 kHz: 0.3% (stereo), 0.2% (mono)
Separation: 35dB at 1kHz
Frequency response: 30–15,000 Hz
Capture ratio: 2.0 dB

0 dB = 0.775V (AF)
0 dB = 1μV (RF)

– Continued on page 2 –

FM/AM CASSETTE CAR STEREO

SONY®

AUD

SECTION 4
CIRCUIT DESCRIPTION

[IC201 (μPD1708AG-690]

μPD1708AG-690 is a 4 bit C-MOS microprocessor for digital tuning, and contains a prescaler which operates up to 150MHz, a PLL and LCD driver on one chip.

1. Outline of Functions

(1) Reception frequencies, Channel space, Reference frequencies, Intermediate frequencies

Destination	Band	Frequency range	Channel space	Reference frequency	Intermediate frequency
U.S.A.	FM	87.9 – 107.9 MHz	200 kHz	25 kHz	10.650, 10.700, 10.750 MHz
	AM	530 – 1,620 kHz	10 kHz	10 kHz	450 kHz
Japan	FM	76.0 – 90.0 MHz	100 kHz	25 kHz	10.650, 10.700, 10.750 MHz
	AM	522 – 1,629 kHz	9 kHz	9 kHz	450 kHz
Other	FM	87.5 – 107.9 MHz	50 kHz	25 kHz	10.650, 10.700, 10.750 MHz
	AM	531 – 1,611 kHz	9 kHz	9 kHz	450 kHz

(2) Radio Functions

1) Auto tuning
   – Scan up: Receives for 5 seconds on each scanned frequency.
   – Seek up: Stays at the frequency first received.
2) Manual tuning
   – Manual up/down: Tuning by step and fast tuning with push switch.
3) Preset memory call
   – U.S.A.: Capable of preset for 6 stations each in FM1, FM2 and AM.
   – Japan: Capable of preset for 6 stations each in FM and AM.
4) LOCAL/DX control output.
5) MONO/STEREO control output.
6) Stereo display.

(3) Tape Functions

1) Direction display
2) METAL control output
3) DOLBY control output
4) AMS control output

(4) Clock Function

12 hour display, colon flashes in one second cycles.

(5) Other Functions

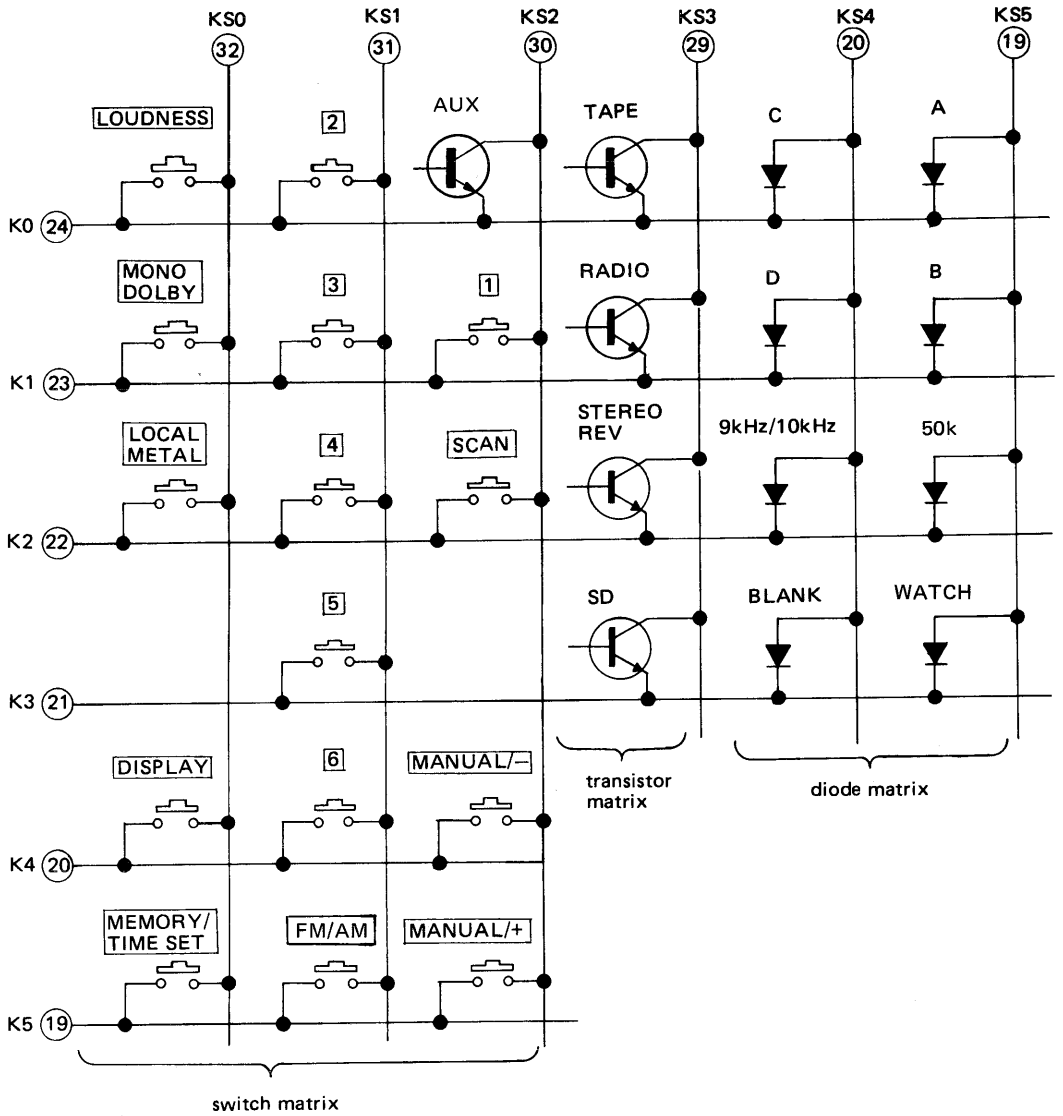
1) LOUDNESS control output
2) Key acknowledge output

2. Pin Functions

Pin No.	Symbol	IN/OUT	Function
1–4 34–52	LCD1–LCD23	OUT	LCD segment signal output pin.
5, 6	COM1, COM2	OUT	LCD common signal output pin.
7, 33	V_{DD}		Power supply pin. Pins (7) and (33) are connected inside the IC.
8	FM	IN	FM local oscillation input pin.
9	AM	IN	AM local oscillation input pin.
10	GND		Ground.
11, 12	EO1, EO2	OUT	PLL error output pin. Outputs "H" when the divided local oscillation frequency is higher than reference frequency, and low when it is lower.
13	CE	IN	Device selection signal input pin. "H" when ACC is ON.
14	NC		Not used
15, 16	XI, XO		Crystal oscillator connection pin. (4.5MHz)
17	MUTE	OUT	Muting signal output pin. Outputs "H" during TAPE/RADIO switching, when frequency changes and during band switching.
18	KEY ACK	OUT	Key acknowledge output. When a valid key functions, outputs "H" for about 44msec to turn the buzzer on.
19 20	KS5-K5 KS4-K4	OUT or IN	During reset during power supply input (VDD ON) or from back-up state (CE, "L" → "H"), output key return signal source for diode matrix take-in. Subsequently function as key matrix key return signal input pins.
21–24	K3–K0	IN	Key matrix key return signal input pins.
25	BAND-AMS	OUT	During RADIO: Band switching signal output pin. Outputs "H" for FM, "L" for AM. During TAPE: AMS signal output pin. Outputs "H" for AMS.
26	LOCAL/$\overline{\text{DX}}$-METAL	OUT	During RADIO: LOCAL/DX signal output pin. Outputs "H" for LOCAL, "L" for DX. During TAPE: METAL signal output pin. Outputs "H" for METAL.
27	MONO/$\overline{\text{STEREO}}$-DOLBY	OUT	During RADIO: MONO/STEREO signal output pin. Outputs "H" for MONO, "L" for STEREO. Only valid during FM, constantly "L" for AM. During TAPE: DOLBY signal output pin. Outputs "H" for DOLBY.
28	LOUDNESS	OUT	LOUDNESS signal output pin. Outputs "H" for LOUDNESS.
29	KS3	OUT	Transistor matrix key return signal source output.
30–32	KS2–KS0	OUT	Switch matrix key return signal source output.

3. Key Matrix

(1) Key Matrix Structure



(2) Diode Matrix for Initial Setting

There are 5 types of diode matrixes for initial setting, as shown below. These are all read in only when power supply is input (POWER ON RESET) and the CE pin goes from low to high (CE RESET), and after that the diode matrix state is ignored.

- Switches for destination setting: A, B
- Switches for AM band channel plan setting: 9kHz/10kHz
- Switch for selection when CE "L" is displayed: BLANK
- Switches for selecting DOLBY and AMS key valid or invalid: C, D
- Switches for setting FM band intermediate frequency: IF1, IF2

These settings are done by shorting or opening the nodes on the matrix with a diode. (On the following table, "1" indicates shorting by diode, and "0" indicates open.)

Diode Matrix for Initial Setting

<table>
<tr><th>Symbol</th><th>Description</th></tr>
<tr><td>A
B</td><td>These are switches for destination setting. Setting is as shown below.
<table>
<tr><th>A</th><th>B</th><th>Destination</th></tr>
<tr><td>0</td><td>0</td><td>U.S.A.</td></tr>
<tr><td>1</td><td>0</td><td>Japan</td></tr>
<tr><td>0</td><td>1</td><td>Other</td></tr>
<tr><td>1</td><td>1</td><td>–</td></tr>
</table></td></tr>
<tr><td>9kHz/10kHz</td><td>These switches are for setting AM band channel plan.
<table>
<tr><th>9kHz/10kHz</th><th>Frequency range</th><th>Channel space</th></tr>
<tr><td>0</td><td>530 – 1,620kHz</td><td>10kHz</td></tr>
<tr><td>1</td><td>531 – 1,611kHz</td><td>9kHz</td></tr>
</table></td></tr>
<tr><td>BLANK</td><td>Switch to select display when (13) CE pin goes low.
0: Clock display.
1: Blank (No display)</td></tr>
<tr><td>C
D</td><td>Switches for selecting DOLBY and AMS key valid or invalid.
<table>
<tr><th>C</th><th>D</th><th>DOLBY</th><th>AMS</th></tr>
<tr><td>0</td><td>0</td><td>X</td><td>X</td></tr>
<tr><td>1</td><td>0</td><td>X</td><td>O</td></tr>
<tr><td>0</td><td>1</td><td>O</td><td>O</td></tr>
<tr><td>1</td><td>1</td><td>O</td><td>X</td></tr>
</table>
In the table, "O" is valid, "X" is invalid.</td></tr>
<tr><td>WATCH</td><td>0: NO WATCH
1: WATCH</td></tr>
<tr><td>50K</td><td>0: 100kHz STEP } FM BAND
1: 50kHz STEP } (AEP Model)</td></tr>
</table>

(3) Transistor Switch for Mode Switching

Unlike the initial setting switches, these switches are always capable of switching. (In the table, "1" means switch ON, "0" means switch OFF.)

Mode Switching Transistor Switches

Symbol	Description
TAPE	Sets RADIO mode or TAPE mode. When TAPE switch is 1, the mode is TAPE regardless of the RADIO switch state. When RADIO switch is 1, the mode is RADIO if the TAPE switch is 0. When both are 0, the mode is clock display.
RADIO	
STEREO REV	During RADIO mode: Stereo signal input switch. When this switch is 1, "ST" is displayed on the LCD panel. However, "ST" display goes out even if this switch is 1 during clock display and during auto tuning. During TAPE mode: Tape running direction display signal input switch. When this switch is 1, "▶" is displayed on the LCD panel when "◀" is 0.
SD	Station detector input during auto tuning. This switch goes 1 within about 50ms after PLL locks. After 1 is detected once, then again 250-375ms later, SD existing is judged.

[IC701 (TC9312N-040)]

TC9310N-065 is a programmable ROM array LSI for sequence control, and performs mechanism control, muting control and LED control.

1. Pin Functions

Pin No.	Symbol	IN/OUT	Function
1	GND		Ground.
2	OSC		Time constant connection pin for internal clock generator.
3	CL	IN	System clear pin. Reset is done by making this pin go from "L" to "H". For "L", the following state exists: – OSC circuit oscillation stops. – Muting output is high. – All other outputs are low. Also, same state as when this pin is low exists when pin (28) VDD becomes less than 3.8V due to the internal auto clear circuit.
4	ACC IN	IN	ACC power supply input pin. By inputting ACC power supply, EJECT is performed when the tape is inserted during KEY OFF EJECT and ACC OFF.
5	TAPE IN	IN	Tape detection input pin. Inputs high when a tape is inserted and detects completion of tape insertion and eject.
6	OUT SW	IN	EJECT detection input pin. Inputs high during EJECT operation and low when it is completed. This pin detects EJECT completion by pin 5 TAPE IN going low.
7	$\overline{\text{FWD/REV}}$	IN	FWD/REV identification input pin. Inputs "L" for FWD, "H" for REV.
8	$\overline{\text{AMS MODE}}$	IN	AMS mode selection pin. Inputs "L" for AMS mode. FF, REW switch ON → FF AMS, REW AMS FF, REW switch ON again → FF, REW During "OPEN" or "H" input: FF, REW switch double pressing is invalid (except pin 15 AMS IN input and pin (18) AMS MUTE, pin (23) AMS IND outputs are valid) and for FF, REW switch ON → FF, REW.
9	$\overline{\text{FF SW}}$	IN	FF switch input pin. "L" during FF switch ON.
10	$\overline{\text{REW SW}}$	IN	REW switch input pin. "L" during REW switch ON.
11	$\overline{\text{STAND BY}}$	IN	Stand-by mode selection pin. "L" input: Stop mode for EJECT switch input within 0.3 seconds. EJECT operation after 0.3 seconds or for double pressing. "H" input: Stop mode. "OPEN": EJECT switch double pressing is invalid, and EJECT switch ON results in EJECT operation.
12	$\overline{\text{EJECT SW}}$	IN	EJECT switch input pin. "L" during EJECT switch on. This input receives continuously and has high priority, so functions with priority over other inputs.
13	$\overline{\text{END}}$	IN	Tape END detection input pin. Inputs 8 pulses "⎍⎍⎍⎍⎍⎍⎍⎍" for 1 reel rotation during PLAY. Judges tape END when "L" for more 0.6 seconds.
14	$\overline{\text{DIR SW}}$	IN	PLAY/DIR switch input pin. Inputs " ⎍⎍ " when PLAY/DIR switch is ON. Inputs via one-shot circuit as it is continuously received input.
15	AMS IN	IN	AMS release signal input pin. Inputs " ⎍⎍ " during AMS detection.
16	STAND BY IND	OUT	Not used.
17	TAPE	OUT	Amp control output, tape system power supply control output pin. "H" during TAPE.
18	AMS MUTE	OUT	AMS muting output pin. Output " ⎍⎍ " during PLAY → FF AMS, PLAY → REW AMS, FF AMS → REW AMS, REW AMS → FF AMS switching.
19	MUTE	OUT	Audio muting output pin. "H" during direction switching, FF, REW and AMS.
20	KEY ACK	OUT	Key acknowledge output pin. " ⎍⎍ " when valid key is input, during tape insertion, and during EJECT.
21	REW IND	OUT	REW LED display output pin. "H" during REW, REW AMS.
22	FF IND	OUT	FF LED display pin. "H" during FF, FF AMS.
23	AMS IND	OUT	AMS LED display output pin. "H" during FF AMS, REW AMS.
24	PLG 3	OUT	DIR solenoid control output pin. DIR solenoid ON at "H".
25	PLG 2	OUT	REW solenoid control output pin. REW solenoid ON at "H".
26	PLG 1	OUT	FF solenoid control output pin. FF solenoid ON at "H".
27	MOTOR	OUT	Motor control output pin. Motor ON at "H".
28	VDD		Power supply pin.

2. Modes and Operation

(1) Reset Operation

Reset operation takes place when pin (3) CL goes from low to high, and during power supply input, when pin (28) VDD goes below 3.8V. When there is a tape inserted during reset, (when pin (5) TAPE IN or pin 6 OUT SW is ON), the operation changes to eject and the tape is ejected. When there is no tape, the mode is OFF.

(2) OFF Mode

OFF mode is all outputs OFF when no tape is loaded (pin (5) TAPE IN and pin (6) OUT SW are OFF). All key inputs are invalid in this mode. When a tape is inserted in this mode (pin (5) TAPE IN goes ON), rewind is done for about 0.6 seconds to take up tape slack and play begins. When a tape is inserted when pin (4) ACC IN is OFF, the tape slack is taken up, then operation changes to EJECT.

(3) EJECT Operation

For EJECT operation, the output of pins (24) PLG3 (26) PLG1 goes OFF, and output of pin (19) MUTE and pin (27) MOTOR goes ON. The maximum time for EJECT operation is 5.7 seconds, and when EJECT is not completed (pin (5) TAPE IN, pin (6) OUT SW both OFF) within this time, ER STOP mode begins. After EJECT operation, OFF mode results.

(4) ER STOP Mode

ER STOP mode is a mode for when EJECT can not be done due to catching in the mechanism, etc., and prevents battery wear by turning all outputs off. During ER STOP mode, it is possible to use the EJECT key to try to EJECT again. When completion of EJECT (pin (5) TAPE IN, pin (6) OUT SW both OFF) is confirmed during ER STOP mode, the mode changes to OFF.

(5) PAUSE Operation

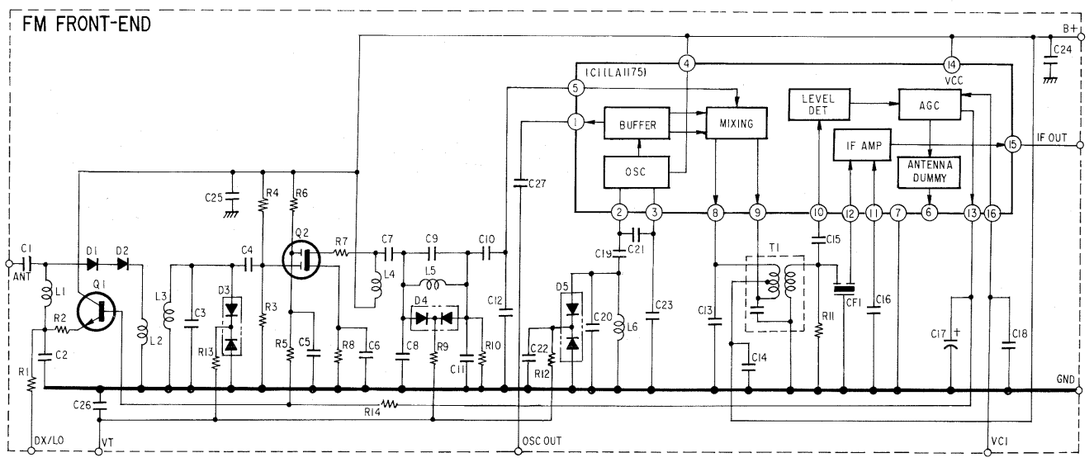
PAUSE operation occurs when pin (4) ACC IN goes off during PLAY, FF, REW, FF AMS, REW AMS. During PAUSE operation, pin (24) PLG3 and pin (19) MUTE outputs are ON, and other outputs are OFF. The maximum time for PAUSE operation is 5 seconds, and pin (4) ACC IN goes ON within 5 seconds after going OFF and PLAY begins. If it stays OFF for more than 5 seconds, EJECT operation takes place. Also, EJECT operation takes place immediately if the EJECT switch is pressed continuously for more than 1 seconds.

(6) STOP (STAND-BY) Mode

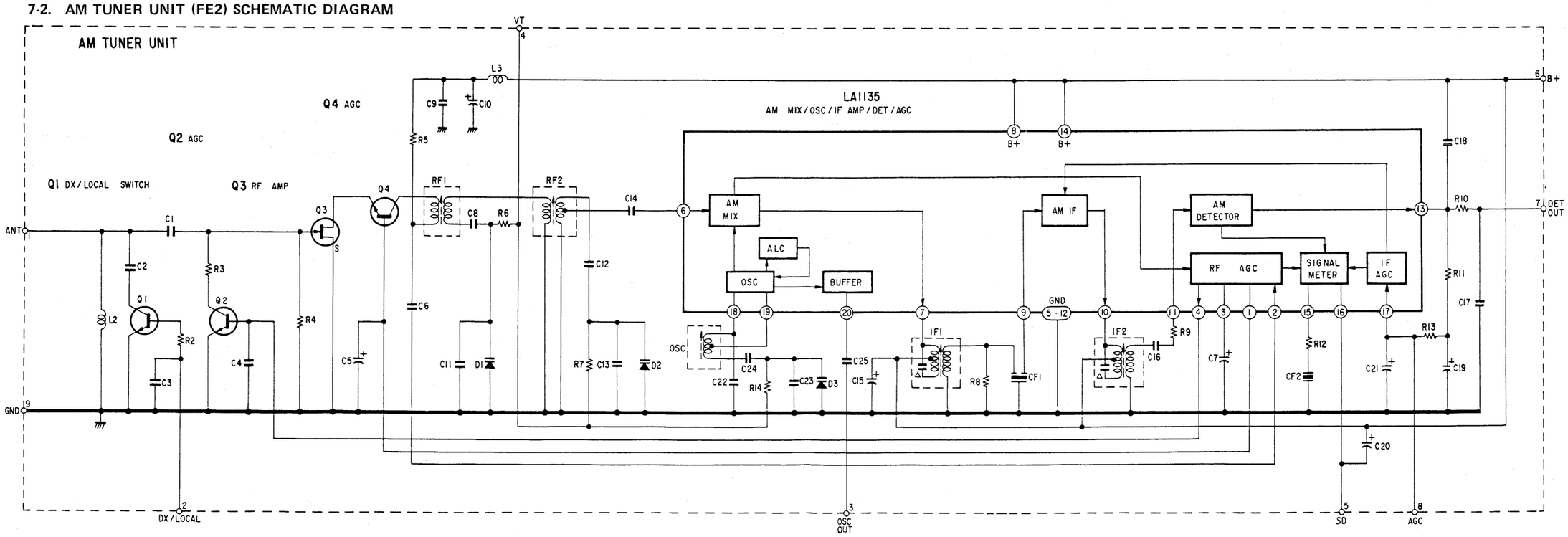
Stop mode takes place when pin (11) STAND BY input is low and EJECT switch is ON, or when it is "H". During stop mode, pin (24) PLG3 and pin (16) STAND BY IND outputs are ON and all other outputs are OFF. When there is pin (14) DIR SW input during stop mode, PLAY mode begins, and when there is pin (12) EJECT SW input, EJECT operation begins. When pin (4) ACC IN goes off during stop mode, PAUSE operation begins, and when pin (4) ACC IN goes on within 5 seconds, stop mode results, and when off for more than 5 continuous seconds, EJECT operation takes place.

SECTION 7
DIAGRAMS

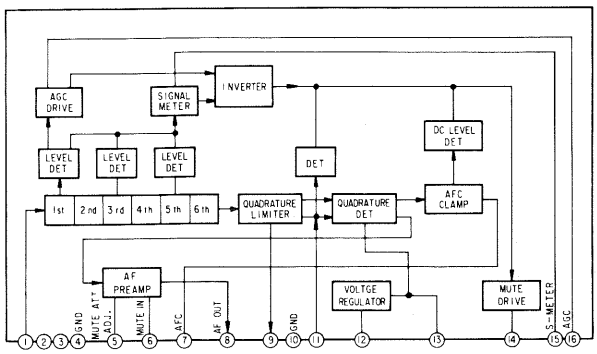
7-1. FM FRONT-END (FE1) SCHEMATIC DIAGRAM



7-2. AM TUNER UNIT (FE2) SCHEMATIC DIAGRAM



IC1 LA1140



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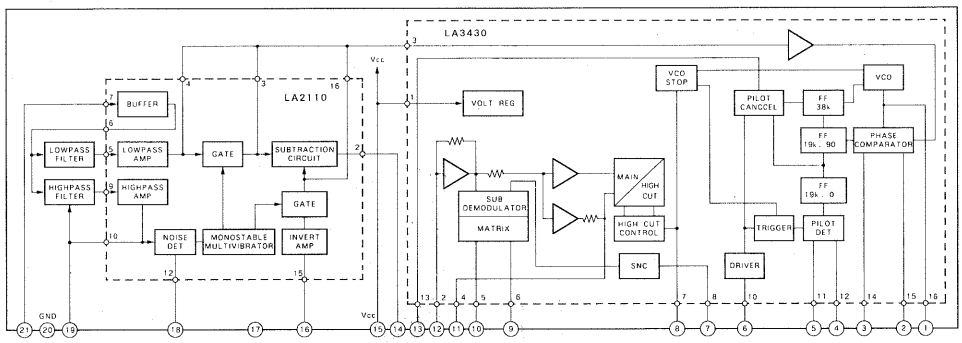

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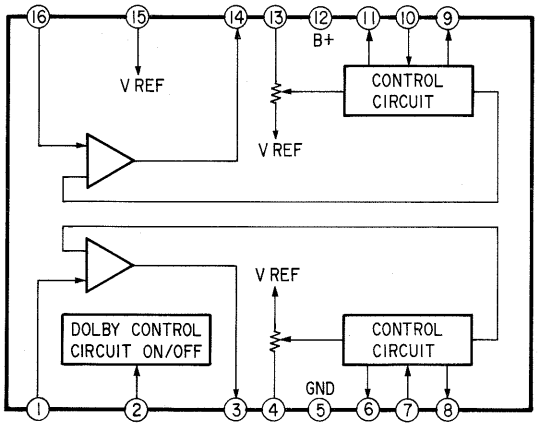
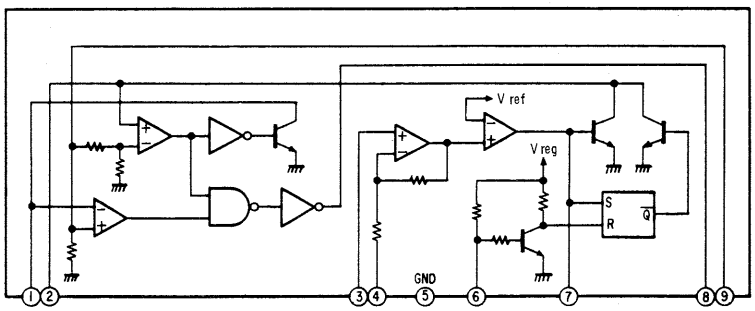


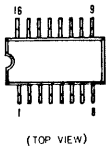
IC305 BA338



- Semiconductor Lead Layouts

BA338

CX20085



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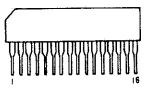

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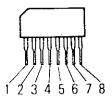
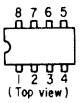


M5280P



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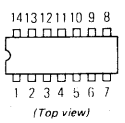
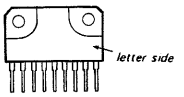
TC4069UBP



TA7280P
TA7281P



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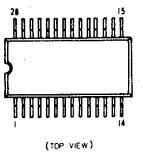

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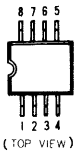

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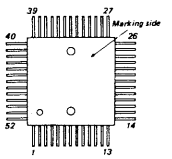

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DTA124ES
DTC124ES
DTC144ES
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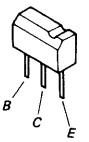
2SC2839-D
2SD1012

2SB909M
2SD973
2SA881
2SD1055-R



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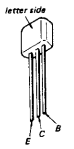

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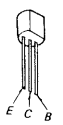

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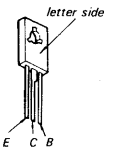

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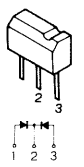

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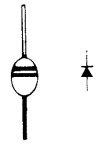
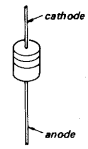
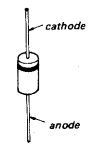


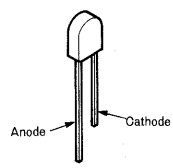
1SS119
RD16ES-B
RD5.6ES-B
RD5.6ES-B1
RD6.2ES-B1
RD10ES-B2
RD3.6ES-B1
RD8.2ES-B
HZS6.8N-B2



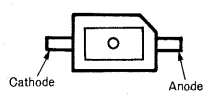
1SS106
10E2



BR4868K



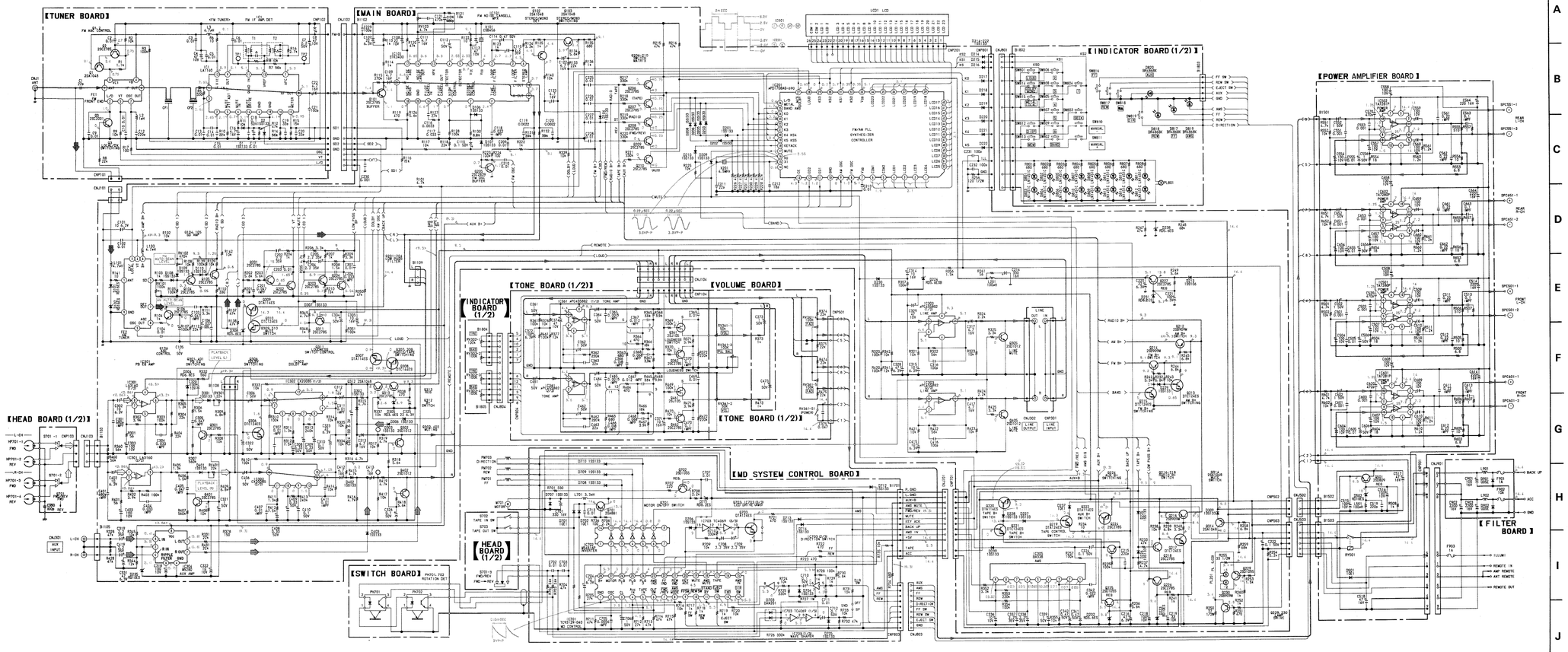
LN1451C



7-4. SCHEMATIC DIAGRAM

• See page for 25 – 27 FM FRONT-END (FE1) and AM TUNER UNIT (FE2).

XR-7100 XR-7100



Note:

- All capacitors are in μF unless otherwise noted. pF: μμF
  50 WV or less are not indicated except for electrolytics and tantalums.
- All resistors are in Ω and 1/4 W or less unless otherwise specified.
- ⟹ : FM signal puth.
- ▨ : AM signal puth.
- ⇨ : TAPE PLAYBACK signal puth.
- ▨ : AUX signal puth.
- △ : internal component.
- ═══ : B+ bus.
- ▭ : adjustment for repair.
- Readings are taken under no-signal conditions with a VOM (50 kΩ/V).
- Power voltage is 14.4 V and fed with regulated dc power supply from BACK UP and ACC terminal.
  No Mark: FM or TAPE
  ( ) : AUX (When applying 14.4V to REMOTE IN terminal.)
  < > : TAPE
  《 》 : AMS
- Waveforms are taken to ground in no-signal mode by using oscilloscope.
  Voltage variations may be noted due to normal production tolerances.

- Switch

Ref. No.	Switch	Position
S701	FWD/REV	FWD
S702	TAPE OUT SW	OFF
S703	TAPE IN SW	OFF
SW801	LOUD	OFF
SW802	BAND	OFF
SW803	SEEK	OFF
SW804	1	OFF
SW805	4	OFF
SW806	2	OFF
SW807	5	OFF
SW808	3	OFF
SW809	6	OFF
SW810	MANUAL –	OFF
SW811	MANUAL +	OFF
SW812	DISP	OFF
SW813	MEM	OFF
SW814	DOLBY MONO	OFF
SW815	METAL LOCAL	OFF
SW816	FF	OFF
SW817	REW	OFF
SW818	■▲	OFF
SW819	PLAY DIR	OFF